THE FUMIGATION OF MEAT PRODUCTS WITH METHYL BROMIDE

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(a Private Communication)

In view of the widespread use of Methyl Bromide fumigation for pest control in various food industries [1, 2], arrangements were made for an experimental fumigation in a meat packing plant in Wisconsin during the Fall of 1948. In accordance with authority granted in a letter to J. L. Maxwell dated September 7, 1948, from Mr. R. M. Mehurin, Chief of Laboratory Section, Meat Inspection Division, Bureau of Animal Industry, U.S. Dept. of Agriculture, Washington 25, D.C., and with the permission of Dr. H. C. Olien, Chief Chemist, Cudahy Brothers Co., Cudahy, Wisconsin, an experimental Methyl Bromide fumigation was conducted in the Cudahy Brothers Co. Meat Packing Plant. This experiment was witnessed by meat inspectors under the supervision of Dr. J. A. Patton, Regional Supervisor, Bur. of Animal Industry, U.S. Dept. of Agriculture, Milwaukee, Wisconsin.

The purpose of this experiment was to determine the efficiency of Methyl Bromide for the control of meat packing plant pests and to determine the effect of this gas on various kinds of meat and meat products.

PROCEDURE

The Curing Laboratory in the Cudahy Brothers Company was selected for this fumigation. This small laboratory, which contained 1500 cubic feet (14.5' x 11.5' x 9') was located on the third floor of the main building of the packing plant. The one outside wall had one window. All the other walls had inside exposures. The window, two doors and various cracks and crevices were sealed with

putty. The outside wall was brick, the floor and ceiling were cement, all of which were fairly gas proof. The other walls were of painted plaster board construction and were not too gas tight, however, the joints were sealed with masking tape and the room held the gas very well.

Just before the gas was released 18 cages containing test insects were distributed throughout the laboratory. Nine cages each containing 5 nymphs, 5 adults and 5 egg capsules of both American and German cockroaches and nine each containing 25 larvae of the Black Carpet Beetle. These cages were placed as follows:

No. of cages containing Black Carpet Beetle Larvae	No. of cages containing roach nymphs adults and eggs	Where Placed
43	1	Desk drawer on North side of room.
66	2	Windowsill on West side of room.
53	3	Top shelf of chemical cabinet on South side of room.
83	4	Top of towel dispenser Southeast side of room.
38	5	Top of beaker drying rack Southeast side of room.
56	6	Top of small table East side of room.
65	7	Top of fluorescent lamp center of room.
99	8	Floor Northwest corner of room.
91	9	Floor Southwest corner of room.
33	10	Untreated check in office - same floor

In addition to the insect test species two white rats and two white mice caged individually were also placed in the laboratory as follows:

No. of cages containing white mice	No. of cages containing white rats	Where placed
1	1	Radiator on West side of room
2	2	Top of table East side of room
3	3	Untreated check in nearby office.

In addition to the test animals various samples of meat and other materials were exposed on the laboratory work table located on the North side of the room. The meat samples consisted of the following:

Pork Sausage
Pork Kidney
Pork Trimmings (D-trimmings)
Hamburger
Beef Trimmings
Skinless Wieners
Bacon
Liver Sausage
Genoa Bologna (Dry Sausage)
Picnic Ham
Lard
Cotton Seed Oil
Beef Tallow (caustic refined)
Pickling brine (28% salt)

A similar set of samples was set aside in a refrigerator in another laboratory to be used as the unfumigated check.

Methyl Bromide was then introduced into the curing laboratory from the outside by means of a "Jiffy Applicator"[3] at the rate of 2 pounds per 1000 cubic feet at 1:30 P.M. on October 7, 1948. The temperature at the beginning of the test was 22°C. The circulation fan was allowed to operate for 20 minutes after the introduction of the gas to insure its good distribution.

The Methyl Bromide was allowed to remain in the curing laboratory for 24 hours. The temperature at the end of the exposure period was 20°C. The gas was quickly aerated out of the laboratory on opening the outside window and turning on the circulation fan.

After the fumigation the Government meat inspectors shipped samples of fumigated and unfumigated meat and meat products to the Laboratory Section, Meat Inspection Division, Bureau of Animal Industry, Washington, D. C. for analysis. Similar sets were taken back to Midland, Michigan where analyses were made in the Main Analytical Laboratory of the Dow Chemical Company.

RESULTS

A cursory examination of the fumigated specimens indicated a 100% kill of all the rodents and insects. The insects, however, were taken back to the Biochemical Research Laboratory of The Dow Chemical Company where they were held for one month to determine the effects of the Methyl Bromide on the roach eggs. From the results given in Tables I and II, it is evident that the fumigation accomplished 100% control of the test insects.

A careful examination of the various meat products indicated no objectional effects as a result of this fumigation.

TABLE I

THE EFFECT OF METHYL BROMIDE FUMIGATION AT THE RATE OF 2 LBS. PER 1000 CU. FT. ON ROACHES

Cage No.	Roach	Life Stage	No.	Mortality No.	Mortality %	% Control
1	Am.	A and N	10	10	100	100
1	Am.	Egg	5	5	100	100
1	Gr.	A and N	10	10	100	100
2	Am.	A and N	10	10	100	100
2	Am.	Egg	5	5	100	100
2	Gr.	A and N	10	10	100	100
3	Am.	A and N	10	10	100	100
3	Am.	Egg	5	5	100	100
3	Gr.	A and N	10	10	100	100
4	Am.	A and N	10	10	100	100
4	Am.	Egg	5	5	100	100
4	Gr.	A and N	10	10	100	100
5	Am.	A and N	10	10	100	100
5	Am.	Egg	5	5	100	100
5	Gr.	A and N	10	10	100	100
6	Am.	A and N	10	10	100	100
6	Am.	Egg	5	5	100	100
6	Gr.	A and N	10	10	100	100
7	Am.	A and N	10	10	100	100
7	Am.	Egg	5	5	100	100
7	Gr.	A and N	10	10	100	100
8	Am.	A and N	10	10	100	100
8	Am.	Egg	5	5	100	100
8	Gr.	A and N	10	10	100	100
9	Am.	A and N	10	10	100	100
9	Am.	Egg	5	5	100	100
9	Gr.	A and N	10	10	100	100
10	Am.	A and N	10	0	0	0
10	Am.	Egg	5	0	0	0
10	Gr.	A and N	10	0	0	0

Note: No. 10 cages were untreated checks

Legend: Am. - American Roaches. Gr. - German Roaches. A. - Adults
Egg - Egg Capsules. N. - Nymphs

TABLE II

THE EFFECT OF METHYL BROMIDE FUMIGATION AT THE RATE OF 2 LBS. PER 1000 CU. FT. ON BLACK CARPET BEETLE LARVAE

Cage No.	No. Larvae per Cage	Mortality		% Control
		No.	%	
38	25	25	100	100
83	25	25	100	100
66	25	25	100	100
91	25	25	100	100
51	25	25	100	100
65	25	25	100	100
56	25	25	100	100
99	25	25	100	100
43	25	25	100	100
33	25	0	0	0

NOTE: Cage No. 33 was the untreated check

The fumigated and unfumigated samples of meats were analyzed in the Main Analytical Laboratory of the Dow Chemical Co. on October 11 and the fumigated and unfumigated fats, oil and brine on October 14. In the Dow laboratories total bromide determinations [4] were carried out, since it has been shown conclusively that the bromide retained by foddstuffs following fumigation with Methyl Bromide exists almost entirely as inorganic bromide after standing a few days [4, 7].

The "bromide residues" found in these meat products (Table III) are of the same order as those found in most fresh fruits, dried fruits, fresh vegetables, and whole grains, and are somewhat less than those generally found in milled grains, cheese, and nut meats [5,6,7,8,9 and 10]

The general conclusion reached by Dudley and Neal [6] of the U.S. Public Health Service that "- - - - foods fumigated with Methyl Bromide, under commercial conditions, would, on the basis of our evidence, probably not contain sufficient quantities of bromine residues to produce deleterious effects" has been adequately substantiated by other investigators and is now widely accepted in the food industry [5,7,8,9,10 and 12] The conclusions of several groups regarding this matter are summarized by von Oettingen (pp 34-35)[11].

TABLE III

TOTAL BROMIDE IN MEAT PRODUCTS FUMIGATED WITH METHYL BROMIDE AT THE RATE OF 2 POUNDS PER 1000-CU. FT.

Product	Grams Total Bromide per 100 grams of Product		
	Analytical Values on Samples		"Bromide Residue" Due to Fumigation
	Unfumigated (Control)	Fumigated	
Pork Sausage	0.0008	0.0041	0.0033
Bacon	0.0010	0.0049	0.0039
Beef Trimmings	0.0007	0.0031	0.0024
Picnic Ham	0.0006	0.0013	0.0007
Pork Kidney	0.0005	0.0069	0.0064
Pork Sausage Trimmings	0.0002	0.0043	0.0041
Hamburger	0.0003	0.0049	0.0046
Liver sausage	0.0007	0.0010	0.0003
Skinless Wieners	0.0005	0.0053	0.0048
Genoa Bologna	0.0008	0.0012	0.0004
Tallow	0.0008	0.0011	0.0003
Lard	0.0006	0.0020	0.0014
Cottonseed oil	0.0011	0.0064	0.0053
Pickle brine	0.0030	0.0034	0.0004

The results of this experiment indicate that Methyl Bromide, at the rate of two pounds per 1000 cubic feet, in the Curing Laboratory of the Cudahy Brothers Company, Cudahy, Wisconsin was sufficient to give 100% control of all life stages of the American and German cockroaches as well as white mice and rats. This test also demonstrated that none of the meat samples or other materials commonly used in meat packing plants were affected adversely. It is also noteworthy that no objectional odors developed in the Curing Laboratory as a result of the fumigation.

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